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APPLICATION FOR UNITED STATES PATENT

ELECTRICAL CIRCUIT TEST APPARATUS

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FIELD OF THE INVENTION

(001) The present invention relates, in general, to an electrical test apparatus. In particular, the present invention relates to a method and apparatus for testing ground fault/arcfault operation and/or disengaging an electrical circuit breaker.

BACKGROUND OF THE INVENTION

(002) Historically, finding and testing electrical circuit breakers installed in a home or commercial buildings has been a laborious task. The central difficulty in finding and testing electrical circuit breakers is the electrical outlet is generally remotely positioned or spaced to its associated electrical circuit breaker. Finding and testing electrical circuit breakers that are greatly spaced apart and at times on separate elevations is typically a multi-person task or a one person task requiring extensive time to execute finding and testing the electrical circuit breakers. Typically, one person would be located at the electrical outlet with some type of test indicator inserted into the outlet. A second person would be stationed at the service panel containing all of the electrical circuit breakers. The second person would disengage one electrical circuit breaker at a time and then ask the first person via any convenient communications means if the test indicator became active. For example, if the test indicator was on it would turn off. If the test indicator was off it would turn on. This process would continue until disengaging a selected electrical circuit breaker would produce the expected results.

(003) Attempts in the past to circumvent the laborious task of finding and testing electrical circuit breakers, as discussed above, involved electrically short-circuiting the electrical outlet. This type of test can be destructive if the electrical breaker is of a sufficient amperage rating to heat and melt the electrical short-circuit as well as the electrical outlet. Further, if an electrical ground fault/arcfault is to be tested the test method discussed above is insufficient.

(004) It would be desirable to have a non-destructive test to find and test electrical circuit breakers. The finding and testing electrical circuit breakers should only require one person to implement. The test apparatus and method would allow indication of the electrical outlet activity i.e., whether or not the outlet was active or energized. The test apparatus would be able to remotely test and disengage an electrical circuit breaker from its electrical circuit outlet.

SUMMARY OF THE INVENTION

(005) The first embodiment of the present invention is an electrical circuit test apparatus for testing a three-conductor electrical circuit outlet's connectivity to its associated circuit breaker. The three-conductor electrical circuit is generally named as the electrical active (Hot), neutral and ground conductors. The first embodiment of the present invention is contained in the housing. A three-conductor electrical cable is connected at one end. A three-prong plug and the other end of electrical cable are connected to the electrical components of the first embodiment of the present invention via the housing. The top portion of the housing has at least one light emitting device and an actuator switch mounted thereon.

(006) The electrical plug is inserted into an electrical outlet connected to its associated electrical circuit breaker. The light-emitting device illuminates connoting the presence of electrical power at the electrical outlet. The actuator switch is engaged momentarily causing a non-destructive electrical short-circuit across the electrical circuit breaker. The electrical circuit breaker, responding to the excess electrical current passing through it, disengages causing the electrical current flowing there through to stop. The light

emitting device sensing the stoppage of electrical current extinguishes thereby indicating the electrical circuit connecting the electrical outlet and the electrical circuit breaker may, if desired, be safely handled without suffering electrical shock.

(007) The second embodiment of the present invention may, if desired, be positioned in the housing the same way as disclosed above. One end of the housing has an opening allowing access to the interior of the housing by the three-conductor electrical cable. The three-conductor electrical cable is connected at one end to a three-prong plug and the other end of electrical cable is connected to the electrical components of the second embodiment of the present invention via the opening in housing. The top portion of the housing has at least one light-emitting device mounted thereon. A selected actuator switch is mounted onto the housing. The light emitting device and the selected actuator switch are electrically interconnected to the three-conductor electrical cable to enable testing the electrical circuit breaker and the electrical ground fault/arcfault indicator.

(008) When taken in conjunction with the accompanying drawings and the appended claim, features and advantages of the present invention become apparent upon reading the following detailed description of the embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

(009) The invention is illustrated in the drawings in which like reference characters designate the same or similar parts throughout the figures of which:

Fig. 1 illustrates a top-level schematic view diagram of the housing containing the present invention,

Fig. 2 illustrates a top-level electrical schematic view diagram of the first embodiment of the present invention,

Fig. 3 illustrates a top-level electrical schematic view diagram of the second embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

(0010) Before describing in detail the particular improved apparatus for testing electrical circuits in accordance with the present invention, it should be observed that the invention resides primarily in a novel structural combination of conventional electrical signal, power transfer components, associated communication circuits, the command and control of the aforementioned components and circuits and not in the particular detailed configuration thereof. Accordingly, the structure, command, control, and arrangement of these conventional components and circuits have, for the most part, been illustrated in the drawings by readily understandable diagrams. The drawings show only those specific details that are pertinent to the present invention in order not to obscure the disclosure with structural details which will be readily apparent to those skilled in the art having the benefit of the description herein. For example, a typical housing 11 for the first and second embodiments of the present invention 10 is illustrated in Fig. 1 as being substantially rectangular i.e., the housing has two long sides adjoined to two perpendicularly mounted short sides. The short and long sides of the housing 11 have a

perimeter edge connected to the bottom portion of the housing 11 along its perimeter edge. The long-sides, short-sides and bottom portion of the housing 11 form walls enclosing an interior portion or cavity of the housing 11. A top portion 16 may, if desired, be used to cover the interior portion of the housing 11. Various portions forming the housing 11 have been simplified in order to emphasize those portions that are most pertinent to the invention. Thus, the diagram illustrations of the Figures do not necessarily represent the mechanical structural arrangement of the exemplary system, but are primarily intended to illustrate major hardware structural components of the system in a convenient functional grouping whereby the first and second embodiments of the present invention may be more readily understood.

(0011) An overview of the first embodiment of the present invention: The first embodiment of the present invention 10, Fig. 1 is an electrical circuit test apparatus for testing electrical circuit outlet connectivity to its associated circuit breaker. Any convenient electrical outlet may, if desired, be used in conjunction with the first embodiment of the present invention 10. An example of a convenient electrical circuit outlet is the three-conductor outlet found in private homes and businesses and used as a vehicle to provide a connection receptacle for devices requiring electrical power to operate. The three-conductor connections are the electrically active (hot), neutral and ground conductors. Any suitable color-coding corresponding to either national or international electrical codes may, if desired, be used to identify the electrically active (hot), neutral and ground electrical conductors.

(0012) The first embodiment of the present invention 10 is contained in housing 11, Fig. 1. A three-conductor electrical cable 17 is connected at one end to a three-prong

plug 18 and the other end of electrical cable 17 is connected to the electrical components of the first embodiment of the present invention 10 via the housing 11. The top portion 16 of housing 11 has at least one light emitting Diode 20 and an actuator switch 19 mounted thereon.

(0013) In operation, the electrical plug 18 is inserted into an electrical outlet connected to its associated electrical circuit breaker. The light emitting Diode 20 illuminates connoting the presence of electrical power at the electrical outlet. The actuator switch 19 is engaged momentarily causing a short circuit across the circuit breaker. The circuit breaker, responding to the excess electrical current passing through it, disengages causing the electrical current flowing there-through to stop. The light-emitting device 20, sensing the stoppage of electrical current, extinguishes thereby indicating the electrical circuit connecting the electrical outlet and the circuit breaker may, if desired, be safely handled without suffering electrical shock.

(0014) A more detailed discussion of the first embodiment of the present invention: The first embodiment of the present invention 10 may, if desired, be housed in any convenient enclosure of any convenient geometrical shape. The enclosure may, if desired, be fire resistant and explosion resistant as required by local or national safety codes. The enclosure may, if desired, be fabricated from a plurality of any materials or a combination of material. Examples of materials are metal, plastic or polymer based material. The shape of the enclosure may, if desired, be round, square, rectangular, oval or any other geometric shape.

(0015) An exemplary first embodiment of the present invention's 10 enclosure is housing 11, Fig. 1. Housing 11 is substantially rectangular i.e., the housing has two long sides adjoined to two perpendicularly mounted short sides. The short and long sides of the housing 11 have a perimeter edge connected to the bottom portion of the housing 11 along the perimeter edge. The long-sides, short-sides and bottom portion of the housing 11 form walls enclosing an interior portion or cavity of the housing 11. A top portion 16 may, if desired, be used to cover the interior portion of the housing 11. The top portion 16 is secured to the bottom portion of housing 11 by four screws 12, 13, 14 and 15.

(0016) One end of the housing 11 has an opening allowing access to the interior of the housing 11 by the three-conductor electrical cable 17. The three -conductor electrical cable 17 is connected at one end to a three-prong plug 18 and the other end of electrical cable 17 is connected to the electrical components of the first embodiment of the present invention 10 via the opening in housing 11. The top portion 16 of housing 11 has at least one light emitting device 20 mounted thereon. An actuator switch 19 may, if desired, be any convenient double pole single throw switch that has a momentary contact capability. Examples of suitable double pole single throw switches that have momentary contact capability are a push-button switch and a spring-loaded toggle switch. The actuator switch 19 is mounted onto housing 11 by any convenient means. The light emitting Diode 20 is mounted onto the housing 11 in any convenient position. An exemplary light emitting Diode 20, Fig. 1 is a light emitting diode having and anode 26 and cathode 27. One pole 25, Fig. 2 of the actuator switch 19 is connected to the anode 26 of the light emitting device 20 and to the electrical active or "hot" conductor 21. The other pole 24 is

connected to the electrical neutral conductor 22. The cathode 27 of the light emitting device 20 is connected to the ground electrical conductor 23.

(0017) In operation of the first embodiment of the present invention 10, the three-prong plug 18 is inserted into an electrical outlet. The light emitting device 20 illuminates indicating the presence of electrical current passing through the associated electrical circuit breaker and the light emitting device 20. The actuator switch 19 is engaged and momentarily short circuits the electrical circuit breaker causing the circuit breaker to become disengaged or "tripping" thereby preventing the flow of electrical current to the light emitting device 20. The light emitting device 20 extinguishes indicating the electrical circuit containing the circuit breaker and the electrical outlet are safe to have maintenance performed thereon, handled or worked on.

(0018) The second embodiment of the present invention 10, Fig. 3 may, if desired, be positioned in housing 11, Fig. 1 the same way as disclosed above. One end of the housing 11 has an opening allowing access to the interior of the housing 11 by the three-conductor electrical cable 17. The three-conductor electrical cable 17 has connected at one end a three-prong plug 18. The other end of electrical cable 17 is connected to the electrical components of the second embodiment of the present invention 10 via the opening in housing 11. The top portion 16 of housing 11 has at least one light emitting Diode 20 mounted thereon. An actuator switch 28 may, if desired, be any convenient six-pole-three-throw switch that has momentary contact capability. Examples of suitable six-pole-three-throw switches that have momentary contact capability are a push-button switch and a spring-loaded toggle switch. The actuator switch 28 is mounted onto housing 11 by any convenient means. A light emitting Diode 20 is mounted onto the

housing 11 in any convenient position. An exemplary light emitting device 20, Fig. 1 is a light emitting diode having an anode 26 and a cathode 27. The pole 29, Fig. 3 of the actuator switch 28 is connected to the anode 26 of the light emitting device 20 and to the electrically active or "hot" conductor 21. The pole 30 is connected to the electrically neutral conductor 22. The cathode 27 of the light emitting device 20 is connected to the ground electrical conductor 23 and the pole 31 of actuator switch 28. The actuator switch's 28 pole 32 is connected to the electrically neutral conductor 22.

(0019) In operation of the second embodiment of the present invention 10: The three-prong plug 18 is inserted into an electrical outlet. The light emitting device 20 illuminates indicating the presence of electrical current passing through the associated electrical circuit breaker and the light emitting device 20. The actuator switch 28 has a center off position. The actuator switch 28 has a first position that when engaged momentarily short circuits the electrical circuit breaker causing the circuit breaker to become disengaged or "tripping" preventing the flow of electrical current to the light emitting device 20. The light emitting device 20 extinguishes indicating the electrical circuit containing the circuit breaker and the electrical outlet are safe to be work-on, handled or have maintenance performed thereon. After the actuator switch 28 momentarily short circuits the circuit breaker, the actuator switch 28 returns to the center off position.

(0020) The actuator switch 28 has a second position that when engaged momentarily connects poles 29 and 32 causing the light emitting Diode 20 to extinguish indicating the ground fault/arcfault function is operating. After the actuator switch 28 momentarily connects poles 29 and 32 the actuator switch 28 returns to the center off position.

(0021) Although only a few exemplary embodiments of this invention have been described in detail above, those skilled in the art will readily appreciate that many modifications are possible in the exemplary embodiments without materially departing from the novel teachings and advantages of this invention. Accordingly, all such modifications are intended to be included within the scope of this invention as defined in the following claim, means-plus-function clause is intended to cover the structures described herein as performing the recited function and not only structural equivalents but also equivalent structures. Thus, although a nail and a screw may not be structural equivalents in that a nail employs a cylindrical surface to secure wooden parts together, whereas a screw employs a helical surface, in the environment of fastening wooden parts, a nail and a screw may be equivalent structures.